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What Are We Doing About Titanium?

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TITANIUM is of great interest to the military agencies because it is a metal possessing a unique combination of properties which can make it a valuable material for construction of military equipment and can contribute in outstanding fashion to the effective operation of this equipment. While titanium is not the lightest, nor the strongest, nor the most corrosion-resistant metal, it possesses these attributes in rather unique combination and, in addition, is a nonstrategic material in the sense that titanium-bearing minerals are found in workable concentrations in many places on the North American continent. It is, in fact, the fourth most abundant metal in the earth's crust suitable for use in construction.

Titanium, however, is a newcomer and, compared to other metals, has a relatively meager background as far as metallurgical knowledge is concerned and almost no background of experience developed by practical applications. Processes for producing titanium are still in their infancy and much developmental work is yet to be done. Methods of fabricating sheet, bar, rod, wire, and other titanium mill products, although basically similar to the usual metallurgical procedures, require special care; and optimum conditions of operation have not yet been established. In addition, fabrication is quite expensive because of the relatively low volume of the present operations. Heat treatment of titanium alloys is still subject to intensive investigation, welding presents many problems, and methods of fabrication of both titanium and its alloys in the consumers' shops have only been explored in a preliminary way. These factors make the processing of titanium a very difficult problem and necessitate large and extensive development programs in order to provide a basis for practical applications aimed at taking advantage of this most interesting metal.

The titanium problem, insofar as the Department of Defense is concerned, is twofold: it involves the designing of research programs to develop needed scientific and technical information on titanium and the provision of sufficient quantities of the metal for prototype testing and final application to military equipment. In order to assist the Research and Development Board of the Department of Defense in coping with this problem, the Minerals and Metals Advisory Board of the National Academy–Research Council organized the Titanium Panel. The members of this Panel were chosen from among outstanding men with metallurgical and technical backgrounds now actively working with titanium. Although, in the deliberations of the Panel, these men do not represent the vari-

ous industrial and research groups with which they are connected, they provide a good cross-section of opinion and knowledge of all phases of production, fabrication, application, and research now under way. Closely associated with the Panel are liaison representatives of the three military departments. One staff member of the Minerals and Metals Advisory Board is permanently assigned to the Panel and the services of several others are available when needed.

In the several meetings that have been held by the Panel, the current research programs being conducted under the sponsorship of the Departments of the Army, Navy, and Air Force have been discussed and evaluated. Particular attention has been given to the size and scope of the program and to the coverage of all phases of metallurgy necessary to titanium and its application. These discussions have revealed that the current military programs provide extensive and excellent coverage of the broad fields of physical metallurgy of immediate interest and are aimed at obtaining the data necessary for prototype development and end-item applications. However, the programs in the field of extractive metallurgy were found to be inadequate and therefore the Panel has suggested increased effort in basic research in the field of extractive metallurgy of titanium.

The extractive processes for the production of titanium involve methods and equipment that are basically new and different from those encountered in the preparation of other metals. Industrial research and development of processes have been badly handicapped by the lack of the usual reservoir of basic and fundamental knowledge upon which efforts in devising efficient and low-cost production methods depend. Neither industry nor Government is devoting sufficient effort to the basic features of extractive metallurgy, and the normal process by which such information is compiled in academic institutions is too slow to meet the need if titanium is to be made available for military purposes in the desired quantities within the next few years.

The basic research program which has been suggested was drawn up by a subcommittee of the Panel after many conferences with industry and with research groups. It is designed to provide fundamental data on chemical reactions and titanium compounds which might be involved in extractive processes for producing titanium. Included were chemical thermodynamic data, kinetics of reaction, chemical analytical methods, chemical activity of molten titanium, and methods of collection and growth of fine metal particles in gas phase and molten salt systems. The program has been approved by the Research and Development Board and is being initiated by the Office of Naval Research. An expenditure of approximately $1,000,000 per year for three years is contemplated.

The Titanium Panel observed that, although many industrial laboratories were attempting to develop extractive processes, evaluation of these processes through the small-scale laboratory and final pilot plant was a slow and tedious process. The Panel, therefore suggested that evaluation in the pilot plant should be accelerated by Government assistance which would make it possible to evaluate a larger number of processes at one time. It further suggested that such assistance should be applied to the supplementary pilot operations testing different phases of a single process and to the final operation of pilot plants for the purpose of gathering engineering data necessary in the construction of production plants. In all instances the assistance should be provided in the early stages to determine economic and technical feasibility of the processes.

Since this pilot plant development work is time-consuming and expensive and since industry would be reluctant to make public the results of work still in the formative stage, the Panel suggested that such processes be screened by a technical evaluating committee operating on a confidential basis. Such an evaluation could be obtained through a small group of qualified men not connected with the producing companies but having technical backgrounds in physical chemistry, chemical engineering, and extractive metallurgy. This would provide a sound basis for the expenditures involved. These recommendations were also accepted and are being put into operation by the Defense Materials Procurement Agency in

its efforts to promote increased production of titanium. Several ad hoc committees operating under the Minerals and Metals Advisory Board are now evaluating processes which the Defense Materials Procurement Agency has been asked to support.

Another phase of the Panel's activity is illustrated by the Titanium Fabrication Conference held in Cleveland, Ohio, last June. The Conference was attended principally by industrial groups representing the aircraft industry, engine manufacturers, and various companies engaged in fabrication of metal parts for these industries. Among the topics discussed were forging, welding, forming, machining, grinding, and the properties and forms of titanium and its alloys commercially available. The discussions were led by individuals directly concerned with specific phases of fabrication, and current developments on these topics were presented. Some time was also devoted to consideration of the quality, forms, and physical properties of titanium and its alloys needed for military equipment and the advantages to be gained by its use.

It was apparent at the Conference that commercially pure titanium could readily be handled without too much difficulty by the usual operating methods although welding, particularly fusion welding, requires careful protection from atmospheric oxygen and nitrogen.

Titanium alloys, on the other hand, present many more problems; some of them are only partially solved. Forging is not too difficult provided the proper temperature ranges peculiar to the individual alloy are observed. Forming, machining, and grinding processes are somewhat more difficult than those encountered with the usual materials because of the high level of physical properties and the fact that heat treatments for the titanium alloys have not been fully developed. Fusion welding poses a particular problem in titanium alloys and has not yet been satisfactorily solved.

In general, the Conference was successful in its purpose of exchanging technical information between the producing, fabricating, and consuming groups, and the opinions expressed reflected complete confidence in titanium and titanium alloys and in the satisfactory solution or circumvention of the many unsolved problems in titanium fabrication.

The Chemical-Biological Coordination Center

KARL F. HEUMANN

Director, Chemical-Biological Coordination Center

ALTHOUGH most scientists are convinced that research during World War II was concentrated in the field of physics because of the development of radar and the atomic bomb, a substantial portion of our scientists were engaged in finding antimalarial drugs, new chemical warfare agents, insecticides, and fungicides. These compounds included many with new chemical structures that had not been tested for biological action. Under the pressure of war emergency, there was little opportunity to examine these data for correlations between chemical structure and biological activity. M. C. Winternitz, then Chairman of the Insect Control Committee of the Office of Scientific Research and Development, suggested a plan for establishing a center to assemble and organize these data, adding subsequent information of a like nature as it appeared. This center would not limit itself to insect and rodent control problems but would extend its scope to a general consideration of all biological actions produced by chemical compounds. Such a program would also require searching the published literature for articles which describe the effect of chemicals on biological systems. It was also suggested that the center sponsor a screening pro-

gram which would facilitate the testing of chemicals for many biological actions. Practical uses for otherwise untested chemicals might be found and, at the same time, information would be continuously accumulating concerning the relationship between structure and biological action.

This plan was adopted on July 1, 1946, and the Chemical–Biological Coordination Center of the National Research Council was established. Initial financial support for the new Center was provided by the Chemical Corps, the Corps of Engineers, the Air Surgeon's Office, the Surgeon General's Office and the Quartermaster Corps of the Army, and the Medical Sciences Division of the Office of Naval Research. Additional subsidy was later provided by the American Cancer Society through the Committee on Growth of the National Research Council, by the National Cancer Institute of the U. S. Public Health Service, by the Bureau of Medicine and Surgery of the Department of the Navy, and by the Atomic Energy Commission.

The first step in organizing the Center was to employ a small technical staff to assemble the many chemical and biological data needed and to develop suitable coding techniques. This staff was assisted by subcommittees representing various scientific disciplines. These subcommittees advised the Center on the development of its chemical and biological codes, on the selection of journals to use as sources of data, and on the development of the abstracting and coding procedures. For nearly six years the work of the Center was carried out under the direction of William R. Kirner. Early in 1952, he resigned as Director of the Center to accept a position with the National Science Foundation.

The original objectives of the Center were the following: *1)* to assemble and organize information which describes the effect of chemicals on biological systems (plants and animals, their organs, tissues, cells, and cell constituents), the metabolism of test chemicals within biological systems, and the mechanism of drug action or information leading to an understanding of such action; *2)* to sponsor the preliminary testing ("screening") of compounds on a variety of plants, animals, and microorganisms to determine the biological effects of the compounds and to make the resulting data available; *3)* to prepare reviews of the literature on the effect of chemical structure upon various biological actions and test methods used in determining such actions; and *4)* to sponsor symposia concerned with the correlation of chemical structure with biological activity. It was recently decided that the last two objectives could be handled adequately by other groups, and these activities were consequently curtailed.

The chemical–biological information which is recorded in the Center's files comes from the following sources: *1)* data resulting from the screening program sponsored by the Center; *2)* unpublished data, positive and negative, which are solicited from governmental, industrial, and university laboratories; and *3)* data from selected scientific periodicals and other published reports. This information is reduced to coded form and entered on IBM punched cards. In order to make use of these mechanical devices, it was necessary to develop a coding method for each of the two fields, chemical and biological. A major portion of the Center's effort in its six years of life has gone into the development of these codes.

The primary purpose in developing the National Research Council *Chemical Code* was to arrive at a method of representing chemical structures by linear symbols, that is, by letters and numbers so that structure codes could be transferred to punched cards. This allows the use of machines in correlating chemical structure with biological activity. Representation of the component parts of a compound, without showing their connection with one another, was considered sufficiently definitive for such purposes. The Code, entitled "A Method of Coding Chemicals for Correlation and Classification," includes detailed directions for the use of the Code as well as a list of coded examples. It was published in 1950 and is available from the Publications Office.

In the development of the *Biology Code,* the problem was one of selectively cataloguing biological data in such a way as to facilitate correlations of specific biological

actions with specific chemical structures. Preparing such a classification was not an easy task, and evolution of the present code required the testing of a number of preliminary trial codes. The current form of the Code is designed to provide sufficient detail to permit correlations, but not so much detail that each bit of information becomes unique. It is an indexing system permitting a multiplicity of cross referencing which makes possible the selection of many different combinations of ideas.

The screening program sponsored by the Center has as its objective the broad preliminary testing of chemicals for their biological effects on a variety of microorganisms, plants, and animals. This testing is done in an endeavor to find uses for those chemicals which have not been previously tested or which have been subjected to a limited number of tests. The laboratories (designated as screening agencies) which conduct the screening tests are all associated with nonprofit institutions. Chemicals for the screening program are solicited from university, governmental, and industrial laboratories. Results of the tests performed by the screening agencies are reported to the Center, and these results are promptly reported to the agency which submitted the compounds. After a suitable period, these data are incorporated into the Center's files and are available to authorized investigators.

The ultimate goal of the Chemical–Biological Coordination Center, that of providing a ready means of correlating structure with biological action, is now being reached. Cards carrying structural codes and biological codes are now available in sufficient quantity to give meaningful answers when they exist. The coded information can be consulted by the scientists and groups who have supported the Center or those who are interested in supporting it or cooperating in its work.

Seventeenth International Geographical Congress

WALLACE W. ATWOOD, JR.

Chairman, United States National Committee, International Geographical Union

ON the occasion of the Seventeenth International Geographical Congress, held in Washington, D. C., August 8–15, under the auspices of the National Academy of Sciences–National Research Council, the United States was host to more than 1,200 geographers representing fifty-five nations of the world. Three hundred and fifty of the Congress participants came from countries other than the United States.

The Congress was a major event for the geographers of the United States because it was the first international geographical congress to be held in this country since 1904. Members of the profession from every section of the country took part in planning the program, which included twenty-three technical sessions, two symposia, twelve commission meetings, four major excursions, an international map exhibit, and a variety of special events. The Association of American Geographers, the National Geographic Society, the U. S. Government, and numerous organizations and individuals contributed generously of their time and resources.

In the course of Congress preparations, nearly 9,000 geographers from seventy-six different countries corresponded with the United States National Committee of the Union. Only four countries known to be conducting geographical work were not heard from: Bulgaria, the People's Republic of China, Rumania, and the Union of Soviet Socialist Republics.

Some of the readers of NEWS REPORT may not be familiar with the operation of an international scientific union; consequently, a word or two about the general structure and organization of the International Geographical Union may be helpful.

The Union is one of the ten constituent organizations of the International Council of Scientific Unions. Its purposes are to promote the study of geographical problems, to initiate research requiring international cooperation, to provide for meetings of international congresses, and to appoint commissions to study special matters during the intervals between Union meetings. Once every three or four years, the Union holds a general assembly and a congress. The general assembly is the official business meeting of the Union and deals with such matters as the admission of new countries, the election of officers, the budget, and the appointment of commissions. The congress, usually held in conjunction with the general assembly, has no administrative responsibilities; it is a professional meeting arranged by the host nation in cooperation with the Executive Committee of the Union.

Membership in the Union is by country, each country adhering through the principal academy of science, research council, or comparable national body. In the case of the United States, the National Academy of Sciences–National Research Council is the official adhering organization. Dues to the Union are paid by the Department of State from funds specifically appropriated for the purpose of facilitating United States participation in international scientific organizations. At the present time, thirty-nine countries are members of the International Geographical Union.

In order to discharge the responsibilities which go with membership in the Union, the Academy–Council maintains a committee composed of geographers representing the various aspects of geographic science and the different geographical organizations of the country. This committee, known as the United States National Committee of the International Geographical Union, advises the Academy–Council on all matters relating to United States participation in the Union.

Normally, the work of a national committee requires one or two meetings a year. But when it is asked to plan and carry through an international congress, it must meet more frequently, organize subcommittees, raise funds to cover organizational and publication expenses of the Congress, and perform a variety of extraordinary duties.

When it was decided in 1949 that the Seventeenth Congress would be held in Washington in August of 1952, the United States National Committee went to work immediately. The Commission on Geography of the Pan American Institute of Geography and History was invited to hold its Third Consultation in Washington in late July of the same year; the Association of American Geographers and the National Council of Geography Teachers decided to hold their 1952 annual meetings in Washington in early August; and the American Geographical Society scheduled its centennial celebration in New York City on the days immediately preceding the opening of the Congress. As a result of this coordinated planning, nearly half of the geographic profession of the United States took part in one or more of the geographical meetings and a majority of this number attended the Congress.

To aid the foreign geographers desiring to attend the Congress and to participate in the excursions planned for them, the National Committee awarded 130 subsistence grants of $200 each and ten travel grants of $500 each. In a further attempt to offset the dollar barrier, the National Committee helped nearly sixty foreign geographers obtain appointments as visiting professors, lecturers, consultants, and research assistants in American institutions.

The Committee planned four excursions: the New England (eight days), the Industrial Cities (ten days), the Southeastern States (ten days), and the Transcontinental (twenty-nine days). All the excursions were planned and conducted by American geographers thoroughly familiar with the regions traversed. For each excursion, a special guidebook was prepared containing route maps, photographic illustrations, and descriptions of the areas visited. Block drawings, cross-sections, and special maps illustrated significant cultural and physiographic features seen en route.

With the cooperation of the national committees of countries adhering to the Union, it was possible to arrange a truly international map exhibit. Displays included pub-

lished and manuscript maps from more than thirty countries, aerial photographs, atlases, globes, and the latest geography textbooks. Because of space limitations at Congress headquarters, exhibit materials sent in by countries in the Western Hemisphere were displayed at the Pan American Union building. The National Geographic Society, the Library of Congress, and the National Archives arranged special exhibits at their respective headquarters.

Technical sessions of the Congress, at which more than 150 papers were presented, were scheduled under the following section headings: *1)* climatology, *2)* geomorphology, *3)* biogeography, *4)* hydrology, *5)* cartography, *6)* demography and cultural geography, *7)* trade and transportation, *8)* urban and rural settlement, *9)* historical and political geography, *10)* resources, agriculture, and industry, *11)* regional geography, and *12)* teaching of geography. There were two symposia arranged especially for the Congress, one on Tropical Africa and the other on World Food Supply. These were well attended and served to direct the attention of geographers, in the first instance, to an important area of the world, and, in the second, to an important world problem still in need of solution.

The following Commissions of the Union reported at the Congress: *1)* Medical Geography, *2)* Periglacial Morphology, *3)* Bibliography of Ancient Maps, *4)* Inventory of World Land Use, *5)* The International Map of the World, *6)* Industrial Ports, *7)* Regional Planning, *8)* Soil Erosion, *9)* Agrarian Geography, *10)* Population, *11)* Terraces, and *12)* Utilization of Aerial Photographs. These Commissions held regular meetings and several of them arranged special sessions, open to all members of the Congress, to discuss the research projects carried out under their direction. With few exceptions, the Commissions appointed by the Union produced noteworthy contributions to the furtherance of geographic science.

The first four Commissions listed above were reappointed by the General Assembly; the other eight were terminated; and the following new Commissions were authorized: *1)* Arid Zones, *2)* Karst Phenomena, *3)* Coastal Sedimentation, *4)* Evolution of Slopes, *5)* Correlation of Surfaces Bordering the Atlantic Ocean, *6)* Library Classification of Books and Maps, and *7)* Geography in Schools. Some of these Commissions will receive financial assistance to hold meetings and to publish reports, while others will operate without aid from the Union. All will report at the next Congress.

At the closing session of the General Assembly, the delegates accepted an invitation to meet in Brazil in 1956 and elected the following officers to serve until the close of that meeting: *President,* L. Dudley Stamp (Great Britain); *Secretary - Treasurer,* George H. T. Kimble (United States); *First Vice-President,* Orlando Ribeiro (Portugal); *Vice-Presidents,* Hans W:son Ahlmann (Sweden), Hans Boesch (Switzerland), George B. Cressey (United States), George Kuriyan (India), Max Sorre (France), and Hilgard O'Reilly Sternberg (Brazil).

No report of the Seventeenth International Geographical Congress would be complete without some mention of the "special events" arranged for the occasion. The first afternoon, delegates to the General Assembly and members of the Congress were welcomed on behalf of the Government of the United States by the Honorable John D. Hickerson, Assistant Secretary of State. Greetings from the National Academy of Sciences–National Research Council were extended by William W. Rubey, Chairman of the National Research Council. That evening, the Honorable David K. Bruce, Acting Secretary of State, and Mrs. Bruce tendered an official reception in honor of the delegates to the General Assembly. On the second day, the National Geographic Society arranged an evening program at Constitution Hall. Leaders of three of the Society's expeditions gave talks illustrated by colored motion pictures, and the voice of Rear Admiral Robert E. Peary, Honorary President of the 1904 Geographical Congress, was heard by transcription from an original phonograph record.

At the official Congress banquet, Alexander Wetmore, Home Secretary of the National Academy of Sciences, welcomed the guests and read a brief message from Detlev W. Bronk, President of the Academy. In this message, President Bronk paid tribute

to the contributions of the geographic profession to the understanding of the world and of the people by whom it is inhabited. He said: "Your concern for the welfare of men and women everywhere by increasing their knowledge of their environment and their resources is of especial significance in these times which call for greater emphasis of human values. We prize the opportunity of joining with you in utilizing discoveries in all fields of science in achieving our great intellectual and social objectives."

After the welcoming remarks by Dr. Wetmore, representatives of the following geographical societies, in existence at the time the American Geographical Society was founded, presented greetings to that Society on the occasion of its one hundredth anniversary: the Société de Géographie de Paris (1821), the Gesellschaft für Erdkunde zu Berlin (1828), the Royal Geographical Society of Great Britain (1830), and the Sociedad Mexicana de Geografía y Estadística (1833). Also in honor of the centennial year, the Honorable Hans W:son Ahlmann, Swedish Ambassador to Oslo, delivered the third Isaiah Bowman Memorial Lecture. The title of his address was "Glacier Variations and Climatic Change."

Following a Congress of this nature, it is appropriate to ask: "What has been achieved? What worthwhile results have been obtained or are assured for the future?" One might list the published reports of the Commissions, the number of cooperative research projects supported, or the number of international agreements adopted. On the other hand, valuable as these results may be, they are surpassed in importance by the benefits resulting from the personal contacts established at the Congress.

Geographers from many different countries lived and worked together throughout the Congress period. They discussed their research problems, debated technical questions, reached compromises on a number of issues, and exchanged views on various subjects. They also met socially at luncheons and dinners, visited informally in the Congress lounge, traveled together on excursions, and frequently discussed international and national affairs. Surely these experiences have proved valuable in many ways: perhaps they have helped us better to understand and appreciate some of the problems confronting the nations of the world in this period of political unrest; perhaps they have produced a greater world consciousness among geographers; certainly they have developed many lasting friendships which will do much to strengthen international cooperation in all fields of human endeavor.

SCIENCE NEWS

AUTUMN MEETING NATIONAL ACADEMY OF SCIENCES

The autumn meeting of the National Academy of Sciences will be held in St. Louis, Mo., November 10–12. Four half-day sessions at Washington University will be devoted to the presentation of scientific papers. A business meeting for members only has been scheduled for Monday afternoon, November 10.

Charles Allen Thomas, President of the Monsanto Chemical Company and a member of the National Academy of Sciences, will deliver the Monday evening public lecture in the Law School Auditorium of St. Louis University. He will speak on the mid-century achievements of engineering based upon science and technology.

Philip A. Shaffer of Washington University Medical School is serving as Chairman of the Committee on Arrangements. The other members of the Committee are Arthur H. Compton, Washington University; Hallowell Davis, Central Institute for the Deaf; E. A. Doisy, St. Louis University School of Medicine; and J. B. Macelwane, S. J., St. Louis University. Alexander Wetmore, Home Secretary of the Academy, is serving as *ex officio* member of the Committee.

ACADEMY PRESIDENT ATTENDS BRITISH ASSOCIATION MEETINGS

Detlev W. Bronk, President of the National Academy of Sciences, delivered the British–American Lecture at the annual meeting of the British Association for the Advancement of Science in Belfast on September 4. Dr. Bronk attended the meeting in his capacity as President of the American Association for the Advancement of Science.

COMMITTEE ADVISORY TO OFFICE OF ORDNANCE RESEARCH

The following changes have been made in the membership of the National Research Council Committee, Advisory to the Office of Ordnance Research: Eric A. Walker, Dean of the School of Engineering at Pennsylvania State College, and Harold K. Work, Director of Research in the Engineering College of New York University, will succeed C. R. Soderberg, head of the department of mechanical engineering at Massachusetts Institute of Technology, and Louis Jordan, Executive Secretary of the Division of Engineering and Industrial Research of the National Research Council; A. Adrian Albert, Chairman of the Division of Mathematics of the National Research Council, and Joseph L. Walsh, professor of mathematics at Harvard University, will succeed Marston Morse, professor of mathematics at the Institute for Advanced Study, and Einar Hille, professor of mathematics at Yale University.

CONFERENCE ON PROPERTIES OF SOLIDS

The Committee on Solids of the Division of Physical Sciences held its third Conference on the Properties of Solids at Lake Geneva, Wis., September 29–October 1. Special emphasis was placed on the structure and properties of solid surfaces. Previous conferences held in 1948 and 1950 had been devoted to a consideration of the phase transformation in solids and the imperfections in nearly perfect crystals.

The Conference program was arranged under the guidance of Cyril S. Smith, Director of the Institute for the Study of Metals at the University of Chicago. R. F. Brill of the Polytechnic Institute of Brooklyn, Harvey Brooks of Harvard University, M. J. Buerger of Massachusetts Institute of Technology, P. P. Ewald of the Polytechnic Institute of Brooklyn, and R. F. Mehl of Carnegie Institute of Technology assisted in setting up the program and served on the Conference panel.

Financial assistance for the meeting was provided by the Air Research and Development Command through its contract with the National Academy of Sciences and by a grant from UNESCO to the International Union of Pure and Applied Physics, whose interest in the Conference was stimulated by its recently established Commission on the Physics of Solids.

The proceedings of the Conference will be published in monograph form.

NEW SOCIETY IN RADIATION RESEARCH

As an outgrowth of interest generated by the work of the Subcommittee on Radiobiology of the Committee on Nuclear Science, a new society, the Radiation Research Society, has been formed. This organization, with an initial membership of over 250 scientists, held its first business meeting in New York City on April 15. Its objectives have been stated as follows: *1)* to promote original research in the natural sciences relating to radiation; *2)* to facilitate integration of different disciplines in the study of radiation effects; and *3)* to promote the diffusion of knowledge in these fields.

In an effort to bring together scientists of widely different backgrounds in a highly specialized field, the governing body of the Society, known as the Council, will include the officers and ten elected councillors. The fields of physics, chemistry, biology, and medicine will be represented by two councillors each. The remaining two councillors will be elected to represent science in general. The officers for 1952–53 are: Raymond E. Zirkle, University of Chicago, *President;* Alexander Hollaender, Oak Ridge National Laboratory, *Vice-President;* Abraham Edelmann, Brookhaven National Laboratory, *Secretary;* and Harvey Patt, Argonne National Laboratory, *Treasurer.*

SYMPOSIUM ON MICROSEISMS

A three-day Symposium on Microseisms, sponsored by the Office of Naval Research and the Geophysics Research Directorate of the U. S. Air Force, was held at Arden House, near Harriman, N. Y., September 4–6. Arrangements for the Symposium were made by R. C. Gibbs, Chairman of the Division of Physical Sciences of the National Research Council. He was assisted by Gordon G. Lill, Head of the Geophysics Branch of the Office of Naval Research, and by H. E. Landsberg, Director of the Geophysics Research Directorate of the U. S. Air Force. Perry Byerly, chairman of the department of geological sciences at the University of California, served as moderator of the meeting.

The following papers were presented at the Symposium: "History of Microseismology," by James B. Macelwane, S. J., St. Louis University; "Tripartite Systems and Direction of Approach," by J. Emilio Ramirez, S. J., Instituto Geofisico, Bogota, Colombia; "Amplitude Distribution of Microseisms," by Marion H. Gilmore, U. S. Marine Corps Air Station, Miami, Fla.; "Microseismic Period Spectra and Related Problems in the Scandinavian Area," by Markus Båth, Meteorological Institute, Uppsala, Sweden; "Ocean Swells and Microseisms," by M. S. Longuet-Higgins, Cambridge University; "Storm and Surf Microseisms," by Florence W. van Straten, Department of the Navy; "Coupling as Related to Microseisms," by Frank Press, Lamont Geological Observatory; "The Mathematical Theory of Microseisms," by J. G. Scholte, Meteorologisch Instituut, De Bilt, The Netherlands.

The following persons participated in the program as discussion leaders: Dean S. Carder, U. S. Coast and Geodetic Survey; G. E. R. Deacon, National Institute of Oceanography, Teddington, England; Jacob E. Dinger, U. S. Naval Research Laboratory; William L. Donn, Brooklyn College; Beno Gutenberg, California Institute of Technology; Norman A. Haskell, Air Force Cambridge Research Center; Joseph Lynch, S. J., Fordham University; Carl F. Romney, Geotechnical Corporation, Troy, N. Y.; and James T. Wilson, University of Michigan.

SCIENCE ATTACHES

The Department of State has announced the appointment of William W. Greulich and Richard T. Arnold as science advisers to the United States High Commissioner for Germany at Bonn and of Harald H. Nielsen as science attaché to the United States Embassy in Stockholm.

Dr. Greulich, professor and head of the department of anatomy in the School of Medicine, Stanford University, has made important contributions to the knowledge of child growth and development. Since 1947, he has participated in the study of the effects of the atomic bomb on children in Hiroshima and Nagasaki. Dr. Greulich is a member of several committees of the National Research Council.

Dr. Arnold is professor of organic chemistry at the University of Minnesota and is noted for his scientific contributions in the field of organic reactions. In 1949, he was honored with the American Chemical Society Award in Pure Chemistry. From 1949 to 1951 he served as representative of the American Chemical Society in the Division of Chemistry and Chemical Technology of the National Research Council.

Dr. Nielsen is professor of physics and chairman of the department of physics and astronomy at Ohio State University. He is widely known for his teaching and research in the measurement and interpretation of infra-red spectra and vibration-rotation energies of polyatomic molecules. In 1949, he was awarded the Medal of the University of Liège for outstanding accomplishment in research. Dr. Nielsen replaces William L. Doyle as science attaché in Stockholm. Dr. Doyle, who served in that capacity since July, 1951, has resumed his responsibilities on the faculty of the University of Chicago.

FULBRIGHT PROGRAM

Applications for United States Government grants for the academic year 1953–54 for university lecturing and postdoctoral research under the Fulbright Act will be accepted until October 15, 1952 for Austria, Belgium and Luxemburg, Denmark, Egypt, France, Greece, Iraq, Italy, Japan, Netherlands, Norway, Pakistan, Turkey, the

United Kingdom and colonial dependencies, and the Union of South Africa.

Nearly 300 awards, approximately half for lecturing and half for research, are offered under the present competition. This figure includes grants in all fields, but the natural and applied sciences are well represented among the subjects designated by foreign institutions as those in which visiting scholars would be particularly welcomed.

Request for application forms and for detailed information regarding specific opportunities in the countries listed above should be addressed to the Conference Board of Associated Research Councils, Committee on International Exchange of Persons, 2101 Constitution Avenue, Washington, D. C.

CHEMICAL–BIOLOGICAL COORDINATION CENTER

On September 2, Karl F. Heumann assumed his duties as the new director of the Chemical–Biological Coordination Center. Dr. Heumann comes to the Center from the Minnesota Mining and Manufacturing Company, where he had served as a member of the Technical Information Section since 1950. He received his M. S. degree from Iowa State College in 1943 and his Ph.D. from the University of Illinois in 1951. He was a Technical Aide in the Chemical–Biological Coordination Center from 1946 to 1947.

STAFF APPOINTMENT IN DIVISION OF BIOLOGY AND AGRICULTURE

George W. Nace, assistant professor of zoology at Duke University, has been appointed Staff Assistant to the Division of Biology and Agriculture and to the Committee on Developmental Biology. He assumed his new duties September 1. Dr. Nace is on leave of absence from Duke University for one year. He received his Ph.D. in zoology (embryology) from the University of California in 1950 and spent the following year at the University of Brussels on a National Institutes of Health fellowship.

STAFF APPOINTMENT IN DIVISION OF ENGINEERING AND INDUSTRIAL RESEARCH

Milton K. Akers, head of the department of electrical engineering at George Washington University since 1942, has been appointed Assistant Executive Secretary of the Division of Engineering and Industrial Research. Professor Akers assumed his new duties on July 15.

Professor Akers did both his undergraduate and graduate work in electrical engineering at the University of Illinois and later served as an instructor at that University. His industrial experience includes service as a research and development engineer with the Western Electric Company, the Bell Telephone Laboratories, and with manufacturers of food handling and processing equipment.

ANIMAL SUPPLIES FOR RESEARCH AND TESTING

The need for adequate standards and methods in the procurement of biological materials for research and testing has become increasingly apparent in recent years. It is obviously just as improper for the scientist to work with inadequately defined animals as it is for him to use impure drugs or badly calibrated measuring instruments. Prompted by these considerations, the Division of Biology and Agriculture decided to call a preparatory conference to discuss the problem. Accordingly, on July 10, representatives of Government agencies, educational institutions, and industrial laboratories engaged in biological, medical, agricultural, and public health research and testing met in Washington. The results of this conference are reported in the following paragraphs.

After evaluating the situation thoroughly, the conference voted unanimously to request the National Research Council to appoint a committee within the framework of the Division of Biology and Agriculture to organize a systematic program in the broad field of procurement and supply of animals for biological and medical research, assaying, testing, and related uses. It was emphasized that the program should aim

at replacing the scattered, haphazard, and piecemeal measures now in use by concerted, systematic, and comprehensive measures that would give the various agencies and groups concerned with the problem an opportunity to coordinate and correlate their individual activities and contributions.

The following tasks for a central, coordinating agency were outlined to guide the committee in its deliberations: *1)* The constitution and relevant properties of animals used for investigations and tests will have to be defined objectively; minimum standards of acceptability and maximum limits of tolerance will have to be set. *2)* In order to ensure an adequate supply of genetically defined strains for specific purposes, production will have to be stimulated; in addition to maintaining existing strains of value, there should be continual search for new and useful mutations. *3)* Standards of identification, heredity, nutrition, etc. of biological materials must not only be established but some means of determining conformance must be devised. *4)* There must be a central registry which will compile a master record of biological materials in general demand and will receive periodic reports on sources, availability, volume of breeding, etc. *5)* Data compiled by the registry should be made available to potential producers and consumers through some sort of bulletin service. *6)* An exchange service should be established, perhaps with the aid of UNESCO, FAO, and WHO, to expedite procurement, currency arrangements, customs clearance, quarantine exemption, etc. for important stocks not available in this country. *7)* There should be coordination of measures to improve the mechanics of rearing, shipping, and protecting animal stocks, including adequate attention to animal welfare.

The conference stressed that the basic principle governing a program of this kind should be to coordinate activities already in existence, to stimulate supplementary activities, and to provide the scientific and professional advice essential to the successful operation of the program, but *not* to engage in actual operational phases.

FOOD AND NUTRITION RESEARCH IN UNITED STATES

A third survey of food and nutrition research in the United States is being undertaken by the National Academy of Sciences–National Research Council under contract with the Department of Agriculture. The two previous surveys published in 1948 and 1950 afforded a compilation of projects, organizations, and professional personnel in this field. All phases of food and nutrition research in academic, governmental, and industrial laboratories were included. This consolidation into a central register has formed a basis for the coordination and evaluation of all research programs in the area. Its wide acceptance by individuals and organizations has served to minimize duplication of subject matter, wastage of the time of research personnel, and inadequate coverage of research needs. The new survey will follow the plan of the earlier ones and will bring the information up-to-date. In addition, it will include suggested food and nutrition research projects in areas where further work is indicated.

VEGETABLE PRODUCTION PROGRAMS

The Subcommittee on Plant Crop Yields of the Committee on Plant and Crop Ecology has initiated a survey of vegetable production programs carried out since World War II on various islands in the Pacific, on Ascension Island in the Atlantic, and in Georgetown, British Guiana. Navy reservists on training duty with the Office of Naval Research have been assigned to the Committee to make a preliminary examination of existing files on the subject and to assist the Committee in its survey program.

A meeting of military personnel concerned with the island survey and of participants in the former Foreign Economic Administration program of vegetable production was held on September 12 to determine the scope and content of the report which will result from the survey.

COMMITTEE ON DEVELOPMENTAL BIOLOGY

The Committee on Developmental Biology of the Division of Biology and Agriculture, operating under a two-year grant of $25,000 from the Rockefeller Foundation, has concluded its first year of activities designed to further the study of development and growth. Paul Weiss, Chairman of the Division, also serves as Chairman of the Committee, which has the following membership: T. C. Byerly, Department of Agriculture; J. W. Foster, University of Texas; W. W. Greulich, Stanford University; K. V. Thimann, Harvard University; and B. H. Willier, The Johns Hopkins University.

In the course of the year, the Committee gave priority to the following matters: *1)* conferences and hearings on underdeveloped and inadequately correlated fields; *2)* a study of educational problems in developmental biology; and *3)* efforts to establish active interchange with workers in the various biological areas contributing to developmental biology.

Along with the Society for the Study of Development and Growth, the Committee sponsored and gave partial financial support to the Symposium on the Dynamics of Growth Processes, which was held at Williamstown, Mass., June 26–29. The Symposium was concerned with the basic problem of how the various elemental processes during development contribute toward the measurable parameters from which we calculate "growth rates." Critical correlation of information from many areas not hitherto brought together (such as virus reproduction, bacterial growth, protein synthesis, intracellular coordination, cell and tissue differentiation in plants and animals, physical factors and chemical regulation of growth, human growth, mathematics of growth, hereditary mechanisms, and population growth) led to considerable clarification of issues.

For a critical examination of the adequacy and consistency of current concepts in developmental biology, the Committee arranged a Conference on Concepts and Terms, which was held May 3–6 at Arden House, N. Y. Discussion of such topics as growth, determination, differentiation, organization, fields, gradients, potency, regulation, etc. led to very fruitful conclusions and pointed up the need for continuing efforts along these lines. The Committee invited two visitors from abroad to these meetings: Dr. Sholl of University College, London, and Professor C. P. Raven of the University of Utrecht, Holland.

The Committee has instituted consultative service to provide an effective means of intercommunication with the working scientists. Twenty-five investigators in areas concerned with developmental biology in various institutions across the country have been appointed as "correspondents" and have assumed the responsibility of collecting local and regional information, reporting on trends, developments and needs, communicating suggestions, and in turn acting as liaison agents between the Committee and the respective institutions. With the aid of this team, a survey of educational facilities in developmental biology, including medical and agricultural training, is now being undertaken as a basis for later recommendations.

CONFERENCE ON RADIO METEOROLOGY

The University of Texas will be host to a Conference on Radio Meteorology scheduled for the second week in November, 1953. This meeting will be sponsored jointly by the American Meteorological Society, the Radar Weather Conference, the Institute of Radio Engineers (through its Professional Group on Antennas and Propagation), National Commission II on Tropospheric Radio Propagation of the International Scientific Radio Union (URSI), and the Joint Commission on Radio Meteorology. Plans are being made for a four-day conference with sessions on such topics as tropospheric radio wave propagation mechanisms, radar storm detection and rainfall determination, cloud physics, turbulence, spherics, refractive index climatology, and forecasting and atmospheric reflections.

Further information concerning the Conference and papers to be submitted may be obtained from Kenneth C. Spengler, Executive Secretary of the American Meteorological Society.

INTERNATIONAL RELATIONS

SCIENTIFIC UNIONS

ICSU

The United States will be represented by an official delegation at the Sixth General Assembly of the International Council of Scientific Unions, to be held in Amsterdam, October 1–3. The following persons have been designated as members of the United States delegation: W. Albert Noyes, Jr., Chairman of the Division of Chemistry and Chemical Technology of the National Research Council, *Chairman;* Lloyd V. Berkner, Associated Universities, Inc.; Walter H. Bucher, Columbia University; Dirk Brouwer, Yale University; J. Wallace Joyce, Department of State; Eugene Sunderlin, National Science Foundation; Wallace W. Atwood, Jr., National Academy of Sciences–National Research Council; and Donald Eddy, Department of State.

IUBS

The following two conferences, organized under the auspices of the International Union of Biological Sciences, were recently concluded: *1)* a conference on the "Biochemical and Structural Basis of Morphogenesis," held in Utrecht, August 27–29, in conjunction with a meeting of the International Institute of Embryology; *2)* a conference on the "Cellular Basis of Differentiation," arranged by the International Society of Cell Biology, held in Stockholm, September 2–6. Paul Weiss, Chairman of the Division of Biology and Agriculture of the National Research Council, attended both conferences. Dr. Weiss is a vice-president of the International Institute of Embryology and a member of the Executive Committee of the International Society of Cell Biology.

A grant to the National Research Council from the Rockefeller Foundation made it possible for the following scientists to participate in one or both of these meetings: E. J. Boell, Yale University; J. D. Ebert, Indiana University; Heinz Herrmann, University of Colorado; A. R. Mirsky, Rockefeller Institute; W. C. Twitty, Stanford University; and B. H. Willier, The Johns Hopkins University.

IUPAC

The XIIIth International Congress of Pure and Applied Chemistry will be held in Stockholm and Uppsala, Sweden, July 29–August 7, 1953, in conjunction with the XVIIth Conference of the International Union of Pure and Applied Chemistry. Plans for the Congress include a special program of the Section on Physical Chemistry and two symposia, one on the chemistry of wood and wood constituents and the other on macromolecules.

The Section on Physical Chemistry will deal with chemical thermodynamics and thermochemistry, electrochemistry, surface and colloid chemistry, and chemical kinetics. The Symposium on the Chemistry of Wood and Wood Constituents will cover such topics as the structural chemistry of wood components, the chemistry of cellulose and hemicellulose and the structure of native and regenerated cellulosic fibres, and the chemistry of lignin and its behavior in the pulping processes. The Symposium on Macromolecules will deal with experimental methods for investigation of macromolecules in solution and will also cover the work on macromolecular properties of proteins and polyelectrolytes.

The Conference of the Union will consist of the meeting of the Council, of the Board (or Bureau), together with the Section on Physical Chemistry and its committees and subcommittees and certain divisions of the Applied Chemistry Section.

Further details concerning the Congress and the Conference may be obtained from Professor R. Delaby, General Secretary, IUPAC, 4 avenue de l'Observatoire, Paris, France.

SYMPOSIUM ON INTERNATIONAL COOPERATION IN SCIENCE

The papers presented at the Symposium on the Development of International Cooperation in Science, held in conjunction with the third annual meeting of the Executive Board of the International Council of Scientific Unions at Washington, D. C., on October 18, 1951, have been published. Copies of this publication may be obtained upon request from the Academy–Council Office of International Relations, 2101 Constitution Avenue, Washington, D. C.

The Symposium was arranged by the National Academy of Sciences–National Research Council in cooperation with the Executive Board of the International Council of Scientific Unions. Speakers included scientists from Great Britain, India, Canada, Switzerland, and the United States.

NAPLES ZOOLOGICAL STATION

E. G. Butler, Chairman of the Committee on the Naples Station of the Division of Biology and Agriculture, has announced that a grant has been obtained from the National Science Foundation for support of the "American Table" at the Naples Zoological Station for a period of two years. This "Table" will be available for use by United States scientists desiring to work at the Naples Station.

REVISION OF ANATOMICAL NOMENCLATURE

Pursuant to a resolution adopted by the International Congress of Anatomy which met in Oxford, England, in 1950, a conference was held in London, May 26–30, under the auspices of the Council of International Organizations of Medical Sciences, to explore the possibility of revising on an international scale the nomenclature of human anatomy. Delegates representing the principal national and linguistic groups of Europe, the British Commonwealth, and the Americas participated.

The conference agreed to bring the Basel Anatomical Nomenclature up-to-date by a conservative revision, making changes only where necessary for scientific correctness. Subcommittees have been appointed to prepare the new lists of terms for each system of organs, and it is hoped that tentative lists will be ready by December, 1953 for editing and submission to the next international congress which is scheduled to convene in France in August, 1955.

T. B. Johnston of Guy's Hospital Medical School in London is the secretary of the Revision Committee. Information concerning the work of the Committee may be obtained from George W. Corner, Carnegie Embryological Laboratory, Wolfe and Madison Streets, Baltimore, Md.

INTERNATIONAL SOCIETY OF PHOTOGRAMMETRY

The Seventh Congress of the International Society of Photogrammetry was held in Washington, D. C., September 4-16. Over 1,250 delegates, representing forty-one nations, attended the Congress. The program, under the direction of L. Ray Smart of the U. S. Geological Survey, included sessions on photography and navigation; plotting machines and instruments; geodetic or control operations; mapping from photographs; special applications and measurements; education, terminology, and bibliography; and photo interpretation. Eighty-nine papers were presented in the course of these sessions.

One of the highlights of the Congress was the Exposition of Photogrammetry which included exhibits prepared by twenty-one commercial firms, ten national photogrammetric societies, and leading foreign manufacturers of photogrammetric equipment. Over 6,000 people viewed these exhibits, along with those prepared by the technical commissions of the Congress, the National Geographic Society, the American Geographical Society, and the Library of Congress. Special interest was evinced in the exhibit prepared by the Library of Congress which displayed the oldest and most recent map of every country represented at the Congress.

Patrik Mogensen, President of the Swedish Society of Photogrammetry, was elected President of the Society for the next four years. The Eighth Congress will be held in Stockholm, Sweden, in 1956.

RECORD OF MEETINGS

July

7–8 Conference on Cargo Handling
9 Nickel Conservation Panel
10 Committee on Animal Procurement
12 Commission on Human Resources and Advanced Training
14 Department Chairmen, Highway Research Board
Mica (Q-Meter) Panel, *New York City*
NRC Committee, Advisory to Office of Ordnance Research, *Durham, N. C.*
15 Committee on Roadside Development, Department of Highway Design, *Princeton, N. J.*
15–16 Toxicology Subcommittee
17 Cermets Sub-Panel, *Cleveland, Ohio*
17–18 Food Protection Committee
23 Steelmakers Sub-Panel, *Pittsburgh, Pa.*
24 Chairmen of subcommittees of Committee on Packing, Packaging, and Preservation, *Chicago, Ill.*
28–29 Basic Research Sub-Panel, *Chicago, Ill.*
30 Committee on Dyeing and Finishing, *New York City*

August

1 Concrete Division, Department of Materials and Construction, *Columbus, Ohio*
Subcommittee on Human Resources, *Lawrence, Mass.*
5 Steering Committee on Uses of Gamma Globulin, *Boston, Mass.*
6 Committee on Tropical Housing and Building
Conference on Chloramphenicol
14 Nickel Conservation Panel
18 Ad Hoc Committee on Titanium Extraction, *Boston, Mass.*
22 Reconstituted Mica Panel
25 Committee on Frost Heave and Frost Action, *Charlottesville, Va.*
28 Executive Committee, Building Research Advisory Board

NEW PUBLICATIONS

Agricultural Research Institute and the Agricultural Board. National Research Council. 1952. 11 p.

Channelization. Highway Research Board Special Report No. 5. National Research Council. 1952. 249 p. $6.00.

Condensation Control in Buildings as Related to Paints, Papers, and Insulating Materials. Building Research Advisory Board. National Research Council. 1952. 118 p. $3.50.

Conference on the Mechanisms of Hormone Action, with Special Reference to the Adrenal Cortical Hormones. Academy–Council Publication No. 224. 1952. 15 p.

Field of Highway Safety Research: a Brief Outline, revised August, 1952. National Research Council. 1952. 42 p.

Fifth Annual Report. Pacific Science Board, 1951. National Research Council. 1952. 96 p.

Granular Bases vs. Pumping. Highway Research Board Bulletin No. 52. National Research Council. 1952. 40 p. $0.60.

Highway Sufficiency Ratings. Highway Research Board Bulletin No. 53. Academy–Council Publication No. 228. 1952. 76 p. $0.90.

Micronesians of Yap and Their Depopulation. Pacific Science Board. National Research Council. 1952. 223 p.

Operations Research for the Guidance of Management: Report of a Symposium, 24 September 1951. Reprinted from *Proceedings of the Fifth Annual Conference on the Administration of Research,* University of Michigan, September 24–26, 1951. 17 p.

Roadside Development. Highway Research Board. Academy–Council Publication No. 222. 1952. 99 p. $1.50.

Squeal of Tires Rounding Curves. Highway Research Board Bulletin No. 51. Academy–Council Publication No. 223. 1952. 16 p. $0.30.

International Geographical Union, XVIIth International Congress, United States, 1952.

New England Excursion Guidebook. Publication No. 1. 155 p. $1.50.

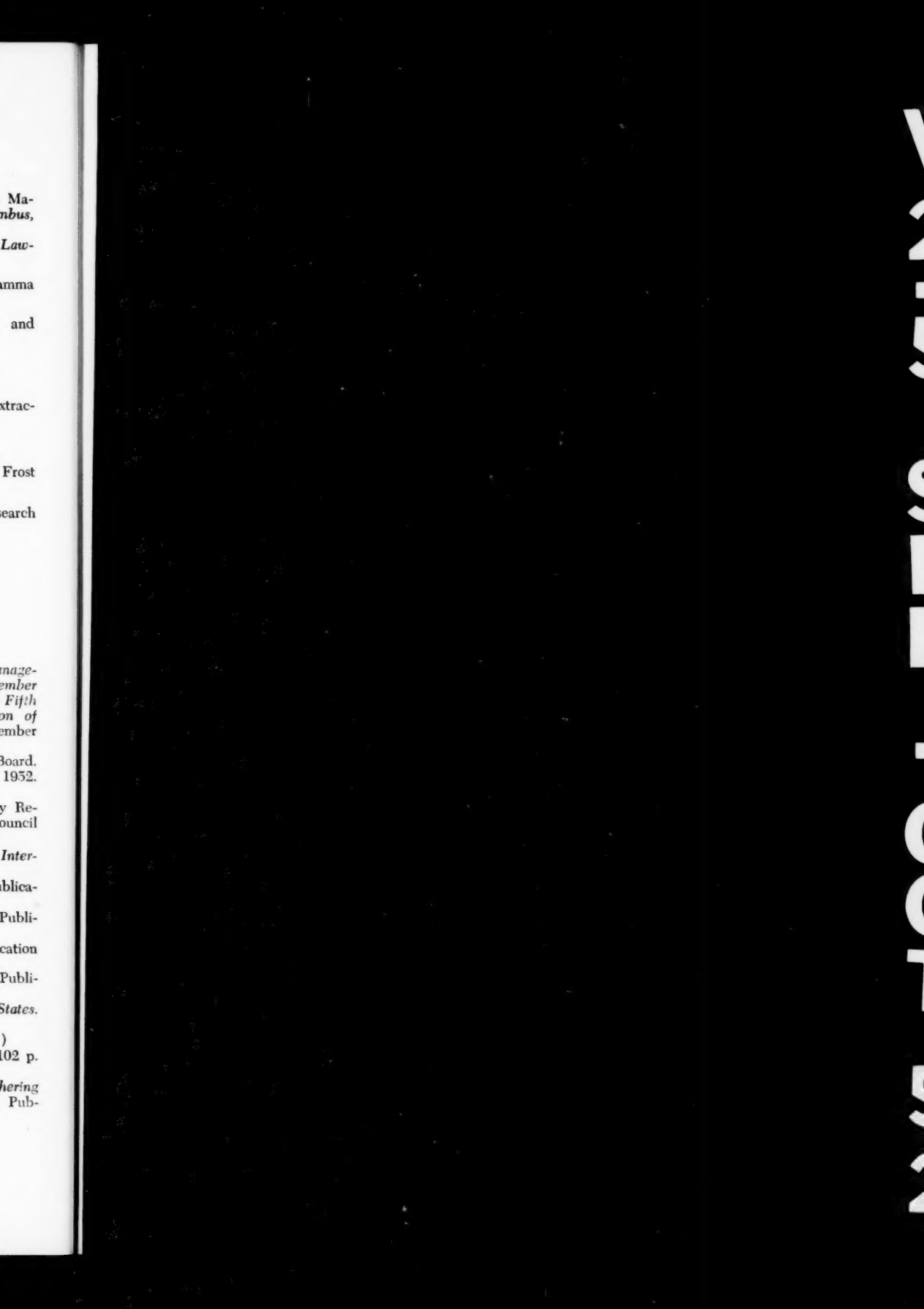
Industrial Cities Excursion Guidebook. Publication No. 2. 115 p. $1.50.

Southeastern Excursion Guidebook. Publication No. 3. 135 p. $1.50.

Transcontinental Excursion Guidebook. Publication No. 4. 274 p. $2.25.

Map of the Landforms of the United States. Publication No. 5. $0.50.

(Items 1–5 purchased as a set, $6.50)

Abstracts of Papers. Publication No. 6. 102 p. $2.00.

The Status of Geography in Countries Adhering to the International Geographical Union. Publication No. 7. 80 p. $0.75.